DESCRIPTION

EXTRACTION TOOL FOR EXTRACTING SPIRAL THREADED INSERTS AND USE OF THE EXTRACTION TOOL

BACKGROUND OF THE INVENTION

The present invention relates to the field of mechanical engineering. It relates to an extraction tool for spiral threaded inserts according to the preamble of claim 1 and to the use of such an extraction tool.

PRIOR ART

Large industrial gas turbines require regular inspections of internal plant parts in order to ensure reliable and efficient operation. Access to the internal plant parts is possible through inspection ports which are provided at various locations of the gas turbine and are sealed with sealing plugs. The sealing plugs are screwed into holes, provided with spiral threaded inserts, in the large inner part of the gas turbine. A known system of such spiral threaded inserts is offered on the market by the American company Emhart Teknologies under the trade name "Helicoil®". When the sealing plugs are removed, the threaded inserts are often damaged and therefore have to be replaced. However, the replacement of threaded inserts which are located in the interior of the main casings of gas turbines was only possible with the previous means if the main casings were opened during a main inspection.

SUMMARY OF THE INVENTION

Accordingly, the object of the invention is to provide an extraction tool with which spiral threaded inserts

of the Helicoil® type inserts can be extracted or removed through narrow inspection ports in a simple and reliable manner and to specify a use of such an extraction tool.

This object is achieved by all the features of claims 1 and 12 in their entirety. The essence of the invention consists in providing, on the extraction tool, an extracting tip in the shape of a steep-angle truncated pyramid which, when the extracting tip is being pressed into the threaded insert, presses with the edges into the threaded insert in a rotationally fixed manner and at the same time fixes it on the extracting tip in a clamping manner, so that it can be unscrewed in a simple manner and, sitting on the extracting tip, can be pulled out through the inspection port.

A preferred configuration of the extraction tool according to the invention is characterized in that the extracting tip has a square cross section, in that the angle of inclination of the faces of the truncated pyramid relative to the perpendicular is only a few degrees, preferably about 1.5°, and in that the extracting tip is made of hardened steel. Due to the square truncated pyramid, with at the same time sharp edges, the pressure of the extracting tip on the threaded insert is uniformly distributed over the periphery. However, it is also conceivable to use a truncated pyramid having a triangular, pentagonal or hexagonal base area.

Since the truncated pyramid of the extracting tip is designed to be very steep, it must be adapted in its outside dimensions relatively accurately to the inside diameter of the respective threaded insert. It is therefore advantageous if the extracting tip is releasably held in the extraction tool so that it can be exchanged. The extracting tip is preferably screwed

to the basic body of the extraction tool, a fastening screw being provided for the screwing of the extracting tip, this fastening screw being inserted through the basic body into a thread arranged on the extracting tip and being supported on that end of the basic body which is opposite the extracting tip.

So that a sufficient torque can be transmitted to the extracting tip from outside, it is advantageous if the extracting tip is subdivided into a section in the shape of a truncated pyramid and an adjoining square section, if the extracting tip, with the square section, sits in an insert in a rotationally fixed manner, if the insert, preferably via a hexagonal section, is inserted into the basic body in a rotationally fixed manner, and if the means for turning the extraction tool comprise a hexagonal tubular piece.

So that blows can be exerted on the extraction tool from the rear with a hammer or the like in order to drive the extracting tip into the threaded insert without causing damage to the extraction tool, an impact adapter can be put onto that end of the basic body which is opposite the extracting tip.

A preferred configuration of the method of use according to the invention is characterized in that the extracting tip, by means of blows on the rear end of the extraction tool, is driven into the threaded insert in such a way that the edges of the extracting tip press into the threaded insert virtually over the entire depth to which the extracting tip plunges into the threaded insert.

Further embodiments follow from the dependent claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is explained in more detail below using exemplary embodiments in connection with the accompanying drawings, wherein:

Fig. 1 shows the configuration of a gas turbine in cross section, with inner part and casing and inspection ports, which are closed by sealing plugs;

Fig. 2 shows the gas turbine from fig. 1 with unscrewed sealing plugs;

Fig. 3 shows an enlarged detail of the threaded insert in the inspection port in the inner part from fig. 2;

Fig. 4 shows, in two partial figures, the longitudinal section through an extraction tool according to a preferred exemplary embodiment of the invention (partial figure 4a) and the cross section through the extracting tip of the tool from fig. 4 (partial figure 4b), and

Fig. 5 shows, in two partial figures (Figs 5a, b), two stages of the press-in operation of the extracting tip of the extraction tool from fig. 4 in a threaded insert which is to be extracted.

WAYS OF IMPLEMENTING THE INVENTION

The configuration of a large turbine, as is suitable in particular as a place of use for the extraction tool according to the invention, is shown in details in figs 1 to 3. The gas turbine 10 comprises an inner part 13 with a rotor 14 inside. The inner part 13 is arranged inside a casing 11. Inspection ports 12 and 15,

respectively, which are in alignment with one another and are in the form of through-holes are arranged at various locations in both the casing 11 and the inner part 13, through which inspection ports 12 and 15 components located in the interior of the gas turbine 10, such as turbine blades for example, can be inspected. The inspection ports 12, 15 can be sealed by sealing plugs 16, 17 which can be screwed into corresponding sealing threads at the entrances of the inspection ports 12, 15. A problem in this case is in particular the sealing thread 18 shown in figs 2 and 3 at the entrance of the inspection port 15 arranged in the inner part 13. A spiral threaded insert 19 of Helicoil® type, which has to be exchanged in the event of damage, is inserted (screwed) into this sealing thread 18.

The extraction tool 20 according to the invention is provided for the exchange of such a threaded insert 19 accessible from outside only through the inspection port 12. A preferred exemplary embodiment of such an extraction tool is reproduced in partial longitudinal section in fig. 4a. The extraction tool 20 of fig. 4a has a tubular, elongated basic body which is welded together from a plurality of parts 23,...,26. At the front end (right-hand end in fig. 4a), the basic body has a receptacle 26 which is provided with a hexagon socket and into which the actual extracting tip 28 together with an insert 27 can be releasably inserted and fastened in the inserted state. Formed on the insert is a hexagonal section 31 which matches the hexagon socket of the receptacle 26. In this way, the insert 27 and the extracting tip 28 are connected to the basic body 23,...,26 in a rotationally fixed manner.

The receptacle 26 is welded to the one end of an intermediate piece 25. The other end of the

intermediate piece 25 is in turn welded to the one end of a tube 24. Welded to the other end of the tube 24 is a hexagonal tubular piece 23, to which a key can be attached if a torque is to be transmitted to the extracting tip 28 via the basic body 23,...,26.

The extracting tip 28, according to fig. 4, has a square cross section and is made of a hardened steel. It has two sections over the length, namely a square section 28.2 of constant outside dimensions over the length and an adjoining section in the form of a steep-angle truncated pyramid 28.1, the side faces of which deviate from the perpendicular by only a few degrees, preferably about 1.5°. The extracting tip 28, with the square section 28.2, is rotationally fixed in a corresponding recess in the insert 27. At the rear end, the extracting tip 28 has a tapped blind hole 29, into which a fastening screw 22 put through the hollow basic body 23,...,26 from the rear can be screwed with a threaded section 30 in order to firmly connect the extracting tip 28 and the insert 27 to the basic body 23,...,26. At the other end, the fastening screw 22 is supported with a screw head 22' on the hexagonal tubular piece 23. The fastening screw 22 is guided with its shank 32 in the through-hole of the intermediate piece 25. An elongated circular-cylindrical impact adapter 21, with which axial blows are transmitted to the extraction tool 20 using a hammer or the like, can be slipped loosely over the knurled screw head 22'.

The extraction tool shown in fig. 4 is very simple but has proved outstandingly successful in the field.

The extraction of a damaged threaded insert from the interior of a gas turbine is carried out as follows according to fig. 5: the extraction tool 20 is inserted with the extracting tip 28 through the corresponding inspection port into the threaded insert 33 to be

exchanged at the entrance of a further inspection port 34 (fig. 5a). With hammer blows on the impact adapter (21 in fig. 4a), the extracting tip 28 is then driven virtually completely into the threaded insert 33 (fig. 5b). In the process, the sharp edges on that part 28.1 of the extracting tip 28 which is in the shape of a truncated pyramid cut into the threaded insert 33, so that the extracting tip 28 sits in the threaded insert 33 in a rotationally fixed manner. If a torque is then applied to the hexagonal tubular piece (23 in fig. 4a) using a key, the threaded insert 33 can be unscrewed. Critical in this case is the angle of inclination of the side faces of the truncated pyramid 28.1. It must be selected to be such a (small) size that the radial forces on the threaded insert 33 are sufficiently small, so that the friction of the threaded insert 33 in its seat is kept to a minimum and the threaded insert 33 can be unscrewed successfully. After the unscrewing, the threaded insert 33 remains sitting on the extracting tip 38 and can be pulled out through the inspection port by means of the extraction tool 20.

Since the extracting tip 28 is interchangeably attached to the extraction tool 20, it can be easily replaced if its edges should have become damaged during use. Exchange is also necessary if threaded inserts 33 of different diameter are to be extracted, since the extracting tip 28, on account of its shape, has to be designed so as to match the respective diameter.

LIST OF DESIGNATIONS

10	Gas turbine
11	Casing
12, 15, 34	Inspection port
13	Inner part
14	Rotor
16, 17	Sealing plugs (screw-in)
18	Sealing thread
19, 33	Threaded inserts
20	Extraction tool
21	Impact adapter
22	Fastening screw
22'	Head (fastening screw)
23	Hexagonal tubular piece
24	Tube
25	Intermediate piece
26	Receptacle (hexagon socket)
27	Insert
28	Extracting tip
28.1	Truncated pyramid (section)
28.2	Square section
29	Tapped blind hole
30	Threaded section
31	Hexagonal section
32	Shank